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MAJOR ENVIRONMENTAL PROBLEMS AND RESEARCH PROGRESS

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Cincinnati, Ohio

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In this first session of your Conference devoted to "Problems" it is most appropriate to include problems of the environment. Certainly we have plenty of them! And, concerned as they are with such basic essentials to life as water, air, shelter, and food they are pretty fundamental problems indeed.

You in Pennsylvania have a broad share of these problems, because of your State's diversity of resources; its varied topography; its industrial, agricultural, and recreational development; its size, its population, and its early start on growth. The same factors which make Pennsylvania a famous and stalwart State also assure it a representative set of environmental problems. Pennsylvania State College was one of the first to offer training in Sanitary Engineering; at present is one of three offering an undergraduate degree in Sanitary Engineering. Real pioneer.

Your Program Chairman has asked me to discuss major problems of the environment, needs related to these problems, and what research is doing and can do about them.

FOOD

Since food is a subject so close to all of us, at least three times a day, suppose we start with it. Perhaps the most important environmental public health fact about food is that despite widely advertised advances in food technology the incidence of food-borne illness has stayed about the same for several years. Actually there is more reported illness from food than from water or air, but we seem less concerned about it.

The problem has two or three major aspects. First, we have had revolutionary changes in the processing, distribution, storage, handling, and preparation of foods. You are aware that you can get food today almost any way you want it: half-cooked, half-frozen, half-roasted, half-toasted, half-baked, fried, or "pied". Hardly anyone bakes a cake from scratch any more. You perhaps can't remember when you had your last bowl of home-made vegetable soup.

Secondly, we alter our foods in many ways. Examples are hydrogenation of fats, denaturation of proteins, degradation of carbohydrates, destruction of vitamins, removal of trace elements. Among the processes employed are high-temperature heat treatments, microwave, infrared, high energy irradiation, and quick freezing.

Thirdly, more people are eating out. The husband who used to take his wife out to dinner twice a year is now taking her out more like once a week. The number of restaurant meals served daily

is estimated at 70 million. Eleven million "school lunchers" eat out 5 times a week during the school year. Approximately half of our food-borne disease occurs in private institutions, at social events such as suppers or picnics, and under other circumstances where the food service is not receiving the benefits of organized food protection programs.

With respect to solution of these problems, the major needs appear to be two: (1) critical epidemiologic examination of our present food control practices to identify the weak links; and (2) modification of our techniques along lines indicated by the epidemiologic assessment. A third necessity is placement of greater responsibility on the food industry for food protection at all stages from processing through serving. At the present time I see little movement in the areas of meeting the first two needs. There is increasing talk of action in the area of the third.

Perhaps a comprehensive survey of perishable packaged foods from source to consumption also is indicated. This could determine whether there are health factors of importance associated with the great changes in processing and subsequent handling that have occurred. The frozen food and dry milk solids industries are moving in the direction of assessing these factors with respect to their food products.

Concurrently there should be research to determine the effects of revolutionary processing methods on food structure,

nutritional qualities, metabolism, and physiological response. Less effort appears to be underway in this direction than, for example, in the evaluation of chemicals in food.

With regard to biological agents in food, our detection techniques need sharpening. A new presumptive test for enterotoxin produced by staphylococci has been reported, but the search continues for a specific chemical test suitable for routine control use. We know still less about viral than about bacterial agents in food. However, the increasingly intensive research on viruses hopefully may yield techniques that will enable us to define and develop preventive measures for virus diseases that may be food-borne, such as infectious hepatitis.

WATER

The protection of our water resources ranks high as a public health problem. For decades health agencies have been concerned with water quality, and they have made very significant contributions to the safety of our water supplies.

Our water treatment plants are objects of high municipal pride; their operators generally are well trained and competent. Our ability to manage public drinking water supplies so effectively that bacterial disease is rarely associated with them may be responsible for a tendency toward complacency. Now, almost suddenly it seems we find ourselves confronted with new and difficult

challenges. The viruses, synthetic chemicals in water, competing demands for the same supply, and perhaps most disturbing -- water shortage. Apart from water shortage per se recent research has demonstrated that simply the convenient availability of water is of significance in reducing the incidence of intestinal diseases such as bacillary dysentery.

While protecting the quality of our waters for public water supply use is a major problem for the health agencies, it actually takes the form of several major problems, including considerations of quantity and re-use. As we add the equivalent of a city the size of Providence, R.I., to our population every month, and our economy pushes rapidly toward a $600 billion annual gross national product, we are using much more water and we are forced to use it more intensively. With water requirements scheduled to double by 1975, we will be "bumping the ceiling" of available supply in an increasing number of places. This is today's problem because it calls for action now to develop ways of using water more prudently, and for ways of re-using it; for bolder ways of distributing it over long distances if need be, as with electricity, natural gases, and oil; and above all for much sound planning.

Through improved and more extensive sewage treatment and better water treatment practices we have been able to hold the line with regard to bacterial quality. This confidence may not be extended to viruses whose role in water sanitation has not been

clearly defined. Within the past year we have seen the first reported outbreak of infectious hepatitis, a virus disease, in a major city having modern water treatment facilities (New Delhi, India).

Synthetic organic chemicals for the most part are not removed by our present "modern" water treatment plants. We know little about the current or potential impact of these chemicals in water upon man's health -- at what concentrations the "breakpoint" of tolerance will occur. As with food protection, epidemiologic and toxicologic research is needed to provide a sound basis for any necessary health agency action.

Since man is so dependent on water to secure his wants and dispose of his wastes, it is evident that with an essentially fixed annual supply, competition for this natural resource will increase with growth of the nation. More skillful planning and management than we have at present will be needed to keep in balance the many competing water demands, for municipal water supply, industrial water supply, municipal and industrial waste disposal, commercial and sport fishing, recreation, wildlife, agriculture, navigation, and power. Flood and drought serve to complicate the problem.

The Monongahela River, originating in the Allegheny Mountains of West Virginia and flowing to the Ohio River through Pennsylvania, illustrates the variety of difficult and significant problems yet

unsolved. These waters, initially of high quality, are impounded in Federally-constructed reservoirs; are polluted by acid mine drainage; industrial inorganic and organic wastes, and raw or incompletely treated sewage from a number of communities. Meanwhile, in the course of its flow to the Ohio River, the Monongahela is used as a source of water supply by a great many industrial plants and by many communities; it is further a power, fish, wildlife, and recreational resource. Among the unsolved problems are:

1. Effects of impoundment on water quality, particularly on dissolved oxygen and on taste-and-odor-producing aquatic organisms.
2. Effect of synthetic organic wastes on the entire stream purification process; and the corollary effect of the stream processes on these wastes.
3. Effect of wastes on fish life.
4. Effect of wastes on water quality and on treatment processes, and their removability by water treatment processes.
5. Control of acid mine drainage.
6. Effect on stream life of increased water temperature resulting from the discharge of industrial cooling waters.
7. Effect of intermittent flows, as from hydroelectric power dams on stream self-purification processes.

8. And perhaps most important to us, the effect on human health of industrial wastes in drinking water supplies.

The foregoing list of problems illustrates the complexity of developing a reasonable basis and framework for administration of a total water resource such as the Monongahela. It points also to the need for acceleration of our research efforts to furnish a sound basis for re-examination and re-shaping of the structure for water resource management. The national trend is toward such re-examination and re-shaping of structure. In the process, health agencies are finding their traditional roles reviewed and in some cases their traditional functions transferred to new agencies. If health agencies are to retain their legitimate and historic role they must improve their knowledge through increased research; participate more actively in broad water resource planning, and be prepared to "deliver the goods" on the health-related aspects.

AIR

A relative newcomer to the health field, air pollution is coming up rapidly as a recognized public concern. Nowhere in this country has the health significance of air pollution been demonstrated more dramatically than here in Pennsylvania at Donora. At the present time we face the same general sort of problem with air pollution that we do in water, namely lack of knowledge. Perhaps because it is newer, a freshness and enthusiasm seems to surround pursuit of the problem. Research into the health effects is moving

forward much more conspicuously than similar research into the health effects of new substances in water. Intricate chemical interactions are being studied vigorously. The newest of modern chemical and physical instrumentation is being brought into play rapidly. Unlike many communicable diseases the effects of air pollution are likely to be more subtle, longer range in onset and more comparable and related to chronic disease and problems of the aging. As cause and relationships unfold, the role of the sanitarian, sanitary engineer, chemist, biologist and other environmental specialists will be larger and more specific in these fields.

It is interesting to note that the pattern of legislation in air pollution is toward a single agency having multiple responsibility for the economic, agricultural, and aesthetic aspects of the problem, as well as for the health aspects. This calls for willingness to assume "broader than public health" responsibilities, if the health agency is to be the leader.

HOUSING AND THE SUBDIVISION

Between 1950 and 1955, one hundred and fifty million people changed residence in the United States. This is the equivalent if not almost the whole population! And 83 per cent of our population growth was in the suburbs -- which often, like a body outside a body, is maintained by the capillaries of the adjacent metropolis. This is particularly a problem in water and sewer

services where the capillaries are underground, unlike electrical, communication, and transportation services which mostly are above ground and more accessible for expansion. Some of these problems are receiving special attention on your program. The septic tank and what to do when the soil is unfavorable illustrates how little research attention has been given the environment. Soil absorption and small community sewage treatment research is moving forward with considerable emphasis at present. Very commonly the problems of the subdivision "fall between the beds" for lack of clear jurisdiction: city, county, and State. The new National Highway Program may be expected further to alter the pattern of housing location.

Health agencies have a responsibility for the health adequacy of housing. The most important place to exert their proper influence at present is, in my opinion, in the planning sessions of municipal, county, metropolitan, State, and regional agencies.

IONIZING RADIATION

In the State where the first commercial nuclear power reactor is nearing completion, it may be commonplace to mention ionizing radiation as a problem. For health agencies, however, the problem goes beyond power reactors, and began long before them. Exposures to radium or x-rays in medicine and to radioluminous materials and radiological apparatus in industries have

been with us a long time. Health agencies have occupied a pioneer position in delineating the health importance of such exposures and in developing necessary protective measures. This work has been carried forward as the atomic energy industry has developed. The health agencies have participated in studies to establish more adequately human tolerance for radiation, and in the development of new approaches to protective measures. We have been active also in such areas as the disposal of radioactive wastes, decontamination of water supplies, and the development of techniques for the routine measurement of radioactivity in air, water, soil, and wastes. It appears to me that the most pressing task for the health agency at the moment is to equip itself for its radiological responsibilities. This means acquiring the staff and facilities necessary for following the trends in exposure, assessing their significance, and taking such steps as are necessary to confine exposures within allowable levels.

Techniques are available for measuring environmental radiation exposures from air, water, and soil. For foods, milk for example, development of practical assessment methods is receiving considerable attention.

OTHER PROBLEMS

A variety of other environmental problems confront us: noise, crowding, community insect and rodent control, rural sanitation, refuse disposal, poultry sanitation, sanitary facilities

for parks and public recreation areas, swimming pool and bathing beach sanitation, hygiene of housing. For most of these problems, research has already provided the necessary basic techniques. It is a matter of what the public wants and what they are willing to support. For example, we may take public recreation areas. America is moving outdoors. The pressure is growing for more camping, picnicking, hiking, swimming, boating, and fishing facilities. Common characteristics of many now in existence are poor insect control and poor sanitation facilities. If you use roadside parks, you are aware of the general lack of adequate water and waste facilities and the abundance of flies. Yet these detractive features could be remedied at comparatively low cost. The "know how" is available.

How to present these problems so that the public can determine what it wishes to buy is not yet clearly understood by most health agencies. We are recognizing, however, that the views of the public should play a greater role in determining the content and objectives of our environmental as well as other health programs.

SUMMARY

Where do we stand, then, with respect to our problems, our needs, and the progress of research?

Our problems are many and most of the newer ones requiring much more intensive research. This research is of three kinds:

1. Research to develop measurement techniques to determine the specific nature, source, concentration, and interaction of environmental contaminants.

2. Research to define the health effects of environmental influences, and to point the way to intelligent preventive or control measures. Logically, this assessment should precede remedial measures. The epidemiologic, physiologic, toxicologic, metabolic, and other aspects of environmental exposure are too generally not satisfactorily defined. Unless more research attention can be brought to bear on these, we may well find ourselves in the position of applying control measures before the health basis is delineated. In fairness to our medical colleagues, it should be recognized that we are to some extent expecting them to delineate the unknown cause of an unknown disease.

3. Research to develop necessary remedial measures when cause and effect relationships are known.

There is an appropriate role for State and local health departments in research. Certainly to pinpoint their special problems, of course, your School of Public Health at Pittsburgh is admirably equipped to undertake environmental research, and is among today's leaders in the field.

We have reason to be optimistic that our programs for providing a better environment can be accelerated. In two major areas, water and air, Congress has declared national policy and

has at the same time opened several doors to accomplish real progress. Thus for the first time in the environmental field, we have for these two fields the specific enabling provisions that have been so valuable in the medical program fields of cancer, heart, mental, dental, infectious, and metabolic disease.

a) Research grants to stimulate the potential in universities and other institutions for acquiring the necessary knowledge.

b) Research contracts to supplement direct Federal research.

c) Teaching grants to improve the quality and quantity of sanitary engineers and related scientists.

d) Research fellowships to attract engineers and scientists to the environmental fields.

e) Grants to States and communities to strengthen their resources for doing the job.

f) Demonstration grant and cooperative project authorizations which make possible a variety of arrangements for doing things that need doing.

All of these are, indeed, a new kind of "shot in the arm" for us collectively. They should serve to catalyze the kind of joint effort needed among the Government agencies, the university teaching and research centers, and industry to do the technical environmental job.

But this support alone, no matter how well used, is not sufficient. For the technical part of the job, but more particularly for the remainder, we are dependent on sound and active medical leadership - on the part of both the public health physician and the private practitioneer - the kind of joint leadership and cognizance you have in Pennsylvania:

a) To see that the medical-health portion of the total job is pursued vigorously.

b) To represent environmental interests at policy, decision and planning levels.

c) To be willing to accept responsibility in the health agency for broad programs of air and water quality management, radiation surveillance, food protection, noise and accident prevention and control, housing and the like; and to support these programs.

d) To provide the tenor and framework that will attract and retain qualified environmental specialists.

Personnel shortages plague almost all the professions. In the environmental field, for example, the production of sanitary engineers has gone down steadily while the problem has been going up sharply. The most important shortage, however, is in medical personnel. The quality and worth of a health agency staff is

very closely tied to the quality and worth of its medical leadership. Many of the same factors which need to be given attention in order to recruit and retain qualified physicians in public health apply to the health officer's staff. Given this kind of leadership and support we on the environmental team believe we can "deliver the goods" and provide the public as good an environment as they want.

Personally I am not worried that we will make the environment too clean. An apidemiologist friend of mine was commenting the other day on the shift in polio incidence toward older age groups. He indicated that people were not completing their "normal" childhood exposures until well into adulthood -- and that if we hadn't cleaned up the water, wastes, food, etc. so well, this wouldn't be happening. We would like to take the credit for having done such a good job (for good or for ill, as you wish), but I suspect that the truth lies closer to something else: We have simply allowed the environment to become so permeated with fumes, dusts, mists, noise, vibration, radiation, and the other offensive by-products of man's activity that no self-respecting bug will live in it.